

## LEARNING SPACES OF INTERDISCIPLINARY KNOWLEDGE: TOWARDS SUSTAINABLE DEVELOPMENT

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### ABSTRACT

Drawing on the recognition that science refers to various ways of knowing (among them the “soft” or social sciences), and that both “hard” and “applied” sciences may be included into the sphere of humanities (because they involve human situatedness), this article argues for the key ethical role that academic spaces of interdisciplinary learning can assume in the future of our societies. Accordingly, it examines the theoretical approaches, methodologies, and dissemination strategies of a Science-Art-Philosophy Laboratory recently created at the Center for the Philosophy of Science, University of Lisboa. In recent decades techno-scientific innovation has generated astounding economic growth, leading to a mounting investment, both public and private, in the research and production of patents, and a corresponding decline of funding towards research and education in the fields of the humanities and social sciences. Although techno-science commands recognition because of its prodigious power of performance, it should not turn into a privileged area of knowledge dictating human progress. In effect, not only do the humanities and social sciences hold a pivotal role in assessing the ethical, social, and environmental problems that accelerated scientific advancement has tended to aggravate, but they also prove indispensable towards a dialogue on the future scenarios of human development.

Keywords: Interdisciplinary Learning, Academic Institutions, Applied Arts and Sciences, Pure Arts and Sciences, Philosophy of Art and Science.

JEL Classification: Z11.

### 1. INTRODUCTION

As early as the fifteenth century, artists, scientists and philosophers recognized that there is an essential interconnectivity between academic fields. Accordingly, they advocated that we should study the philosophy and science of art, as well as the art and philosophy of science, so as to improve human knowledge and wellbeing.

Remarkably, five hundred years later in academic institutions we are witnessing a renewed divide between the “two cultures”, as proclaimed by C. P. Snow’s thesis in 1959, when he argued that the “culture” of science contains a great deal of rigorous argument, of a higher conceptual level than that of the traditional humanities. This divide, between the arts, humanities and most social sciences on one side, and the “hard” sciences on the other has in fact been encouraged by political and financial structures, in the name of “innovation” towards ever-increasing economic growth.

In this article I argue that although science and technology command recognition because of their prodigious power of performance—as manifest through the combined advancements of ICT, robotics, bio and nanotechnology—they should not turn into a privileged area of knowledge dictating human progress. In effect, not only do the arts, humanities and social sciences hold a pivotal role in assessing and interpreting the ethical, social, and environmental problems that accelerated scientific advancement has tended to aggravate, but they also prove indispensable towards a wider debate on alternative future scenarios of human development.

### 2. SCIENCE-TECHNOLOGY VS. ARTS-HUMANITIES?

In the early twenty-first century Professor of Literature Stanley Fish remarked: “If there is to be a Brave New World in higher education, it doesn’t look as if the humanities and the arts will be a significant part of it,” once we confirm how “all the emphasis” is being placed “on science, partnerships with industry and advances in technology.” In effect, as of the mid-twentieth century, especially after WWII, the field of science gained a primacy over the arts

and humanities. Particularly in the last decade, we are witnessing an economic push to increase science, technology, engineering and math majors at the university (so called STEM), and a mounting investment, both public and private, for the invention of techno-scientific patents, with a corresponding decline of funding towards research, education and creativity in the fields of arts and humanities.<sup>11</sup>

In order to understand why the arts/humanities are not considered lucrative by current economic standards, I suggest we first grasp what may distinguish them from science. The word science derives from the Latin *scientia*, which is a translation of the Greek term *episteme*, meaning the study of the eternal order of things or the pursuit of knowledge. Significantly, since the first century BCE and until the seventeenth century, science belonged to the umbrella of Humanities, or to the Liberal Arts, so-called because they were designed to cultivate the knowledge of “free men” (non-slaves). The Liberal Arts comprised the study of nine subjects: music, geometry, architecture, astronomy, medicine, grammar, rhetoric, logic and arithmetic (Burguete & Lam, p.40). During those eighteen centuries, scientists were actually called “natural philosophers,” since they wondered about and studied *natural* phenomena.

With the “mechanical philosophy” initiated by Descartes in the seventeenth century, a new concept of science emerged: that of a discipline based on hypotheses and probability, required to report observed results through quantitative methods. Because Cartesian dualism placed the mind in a position of hierarchical superiority over and above nature and materiality, including the nature and materiality of the body, the foundations of knowledge itself became indifferent to any considerations of subjectivity (Bleeker, p.149). Gradually, science divorced itself from the arts and humanities, to finally develop into a specialized field and autonomous profession for the last 150 years.

But just as the sciences were once deemed liberal arts, the disciplines that presently make up the field of arts/humanities may be considered sciences. Already in the fourth century BCE, Aristotle recognized various approaches to the investigation of nature—including poetics and metaphysics—each of which may justifiably be called science. “In other words, ‘science’ is an analogical term, to be recognized in its diversity and complementarity” (Weisheipl, p.XXI). In that vein, it is now common to address the social sciences and a few humanities as “soft sciences.” Most recently, in 2011, Chinese physicist Lui Lam claims that all quests for knowledge are efforts to understand Nature, its human and nonhuman systems, and that therefore all these quests, including literary fiction and the fine arts, fall into the science domain (Lam, 2008).

The fact that Sciences were once considered Humanities, and that the Arts and Humanities may now be viewed as Sciences, suggests an urgent interdisciplinary change in the curricula of academic institutions.

### 3. ARTS ≠ SCIENCES OR APPLIED ARTS/SCIENCES ≠ PURE ARTS/SCIENCES?

If both arts and sciences are ways of knowing, perhaps the difference between them lies in their distinct objectives and methodologies. Accordingly, it is said that scientists have the goal of advancing knowledge through rigorous and rational arguments, by testing hypotheses, and thereafter sharing, reviewing and revising their discoveries; whereas artists want to achieve original works through their individual subjectivity, intuition and emotion.

These disparities are not applicable, however, once we verify that there are major differences between applied science and basic-theoretical-pure science; and equally profound contrasts between the applied arts and the free or “fine” arts. A similar difference exists between *tekhné*, techniques or methods for effecting practical results; and *poiesis*, a term in ancient Greek at the root of the word “poetry”, a verb that meant creating, producing, transforming, and therefore referred to all forms of artistic creativity. In effect there may be greater affinities between so-called pure science and pure art. As mathematician François Lionnais noted, theoretical or “creative” science is driven by curiosity and a “love of play” that encourages inventive thought; like art it wonders at objects and phenomena and “cannot be attained in a climate completely devoid of emotion.” (Lionnais, p.73) In the same vein, according to the Romantic theory of art, artists are often gifted with “internal powers” that enable them to imagine and create worlds that do not exist—thereby pointing to the potential otherness of reality and to an endless capacity for change and transformation. Free art, or non-applied art, is a form of philosophical and historical action (Behler, 1993); unlike the applied arts such as advertising, fashion and automotive design, it has no instrumental purpose, and seldom is economically “useful.”

In our times, however, whenever we talk of scientific “innovation” as crucial towards prosperity in a highly competitive world ruled by the logic of capitalism, we are typically referring to technoscience, an applied science that relies heavily on technology and which has acquired a central role in human progress. As physicist Lévy-Leblond claims, nowadays there is a dangerous tendency to identify scientific research with industrial innovation; as a result, even pure science and conceptual knowledge are being devalued. Most scientific research today is tool-driven rather

<sup>11</sup> As E. Wilson states, in 2014, for the first time in 400 years of its functioning, Harvard University has more students enrolled in science than in the humanities. In the U.S. since 2011, President Obama’s *Educate to Innovate* initiative has provided billions in additional federal funding for science, technology, engineering, and mathematics (STEM) education programs across the country. See Burke, Lindsey M., and Jena Baker McNeill. “Educate to Innovate: How the Obama Plan for STEM Education Falls Short”. *Background*, No. 2504, Heritage Foundation, 2011. Regarding the steep decline of funding for the Arts and Humanities since 2009, see “Trends in Arts and Humanities Funding 2004-2012,” in <http://www.researchtrends.com/issue-32-march-2013/trends-in-arts-humanities-funding-2004-2012>. Accessed 13 March 2016.

than theory-driven.

Technoscientific innovations are usually considered value-neutral, since produced within a rationale solely guided by efficiency; however, their independence from social, economic, and political agendas should be contested. In effect, although science is considered exact because it supposedly excludes human morals and biases from its method, the technological products of science have profound and widespread effects upon our development, in its social, ethical, environmental and biological dimensions.

To provide an example, I was recently at an international conference concerning the future of education in Portuguese-speaking African countries, in which a large number of presentations proposed that the mere introduction of ICT devices in schools might generate literacy and support inclusive growth. Although ICT's potential of renovating economies is unquestionable, we seem to be forgetting that its devices (PCs, tablets, mobile and smart phones) are generally expensive; have to be replaced and upgraded very often; that the production of their components requires large amounts of fresh water and minerals, including rare metals; and that they account for 70% of the overall toxic waste currently found in landfills (OECD report 2015). E-waste is expected to continually increase, because people are upgrading their mobile phones, computers, televisions, audio equipment and printers more frequently than ever before.

Furthermore, the normative use of these ICT devices involves a set of assumptions about the nature of knowledge and intelligence, encouraging rapid and distracted sampling of small bits of information from many sources, and hindering our capacity for contemplation and reflection. Their ethic of knowledge is an ethic of speed and efficiency, of optimized production and consumption. Likewise, ICT technologies have marked implications on the sense of collective life and urban community; unless concerted action is taken, these technologies are actually intensifying the gap between younger and older generations, urban and rural dwellers, between the rich and the poor (WEF Global IT Report 2015, p.26). In short, ICT technologies are not by themselves the solution towards literacy in Africa.

#### 4. TOWARDS INTERDISCIPLINARY KNOWLEDGE

Contemporary science lacks an essential component common to the arts, humanities and social sciences, namely the critical dimension, which enables a reflection of its ethical value, social significance and environmental impact. It is in this respect, I hold, that academic institutions can assume a key ethical and social role in our technological-economic development, by implementing programs of interdisciplinary education and research.

An interdisciplinary approach is paramount in the case of academic institutions since their relationship with the corporate sector has become increasingly tight during the last two decades, with industries funding scientific research, and universities providing business profit through their inventions (Garcia & Martins, p.400). As Sheldon Krinsky notes, the classical idea of the university as an organization where knowledge is being pursued disinterestedly, or as a public resource to seek and find solutions for collective problems, is giving way to a notion of the university as engine of industrial productivity and as strategic resource towards national defense. Once universities abandon their distinctive mission of providing public and universal knowledge and instead start serving special interests that neglect ethical concerns with individuals and social cohesion, they lose their unique status in our culture, "in which case democratic societies will have to invent substitute institutions to replace the loss (Krinsky, 1988).

Because we still strive to maintain the classical mission of academia,<sup>12</sup> at the University of Lisbon in Portugal, the Research Center for the Philosophy of Science (CFCUL) promotes interdisciplinary research and training, as well as activities that disseminate interdisciplinary knowledge for a wide-ranging audience. Established in 2003, and having recently been awarded financial support for its strategic program until 2020, this research unit is chaired by Professor Olga Pombo, a philosopher specialized in epistemology and interdisciplinary studies, and involves a team made up of integrated members and associates from other national and international institutions.<sup>13</sup>

The Research Center comprises five major Research Groups (RG): Epistemology and Methodology (Logic and Methodology; Philosophy of Mathematics; Evolutionary Epistemology; Science and Communication); Philosophy of Natural Sciences (Philosophy of Space, Philosophy of Quantum Physics; Emergence and Relational Metaphysics); Philosophy of Life Sciences (Bioethics; History and Philosophy of Medicine; Philosophy of Biology); Philosophy of Human Sciences (Science, Ethics and Politics; Science and Society, Philosophy of Human Technology); Science and Art (Body, Territory, Cartography, Image, Science-Art-Philosophy Laboratory). The research results are circulated within the scientific community through national and international seminars, conferences, and residencies; by means of books and papers published in its own international peer-reviewed journal of open access, *Kairos* (established in 2010). Additionally, ongoing interdisciplinary findings are disseminated to a wider-ranging public through summer

<sup>12</sup> The term University derives from Medieval Latin *universitas*, referring to "a whole, aggregate, a number of persons associated into one body, a society, company, community, guild"; from *universus* "all turned into one."

<sup>13</sup> Currently, the CFCUL has about one hundred and fifty associates, comprised by integrated researchers and professors (65), non-integrated national scholars (22), non-integrated international scholars (37), Ph.D. students (20), Master students (6), and permanent academic/administrative personnel (3).

schools, workshops, talks and exhibitions.

The fact that the center is affiliated with the Faculty of Sciences rather than with a philosophy department has facilitated cross-fertilization between disciplines, and side-by-side work with scientists from a wide disciplinary spectrum. Thus, a major achievement of the center has been the approval of an “International Doctoral Program in Philosophy of Science, Art, Technology and Society” in a competitive national call launched in 2012 by the Portuguese Foundation for Science and Technology (FCT). Based upon an interdisciplinary notion of Philosophy of Science, and merging 12 faculties from 4 different universities, this doctoral program provides a unique opportunity for students to develop their doctoral studies along interdisciplinary research lines.

Philosophy of science allows us to discover the correlations between scientific laws and the social order that discovers them; it helps to situate ideas historically, to explain how they arose and why people accepted them and acted accordingly. Through an interdisciplinary literacy in arts-sciences-humanities we may understand that there is no such thing as a single science that reveals a uniform truth about the world, or act as guide in matters of reality. Science does not speak with a single voice; different sciences have vastly different ideologies, stemming from ideas that result from historical accidents, social forces, the intelligence of individuals and even the idiocy of others (Feyerabend, p.54-5).

The concept of interdisciplinarity is obviously not new, and has enjoyed great popularity among scholars and funding institutions in recent years. However, at least in Portugal, disciplinary boundaries are still very resilient in higher education structure and culture. In order to promote interdisciplinarity in academic institutions we need to gather strong support from the university leadership, to safeguard long-term funding, to adjust administrative procedures, to encourage teachers to make their teaching interdisciplinary, and to gradually redesign the curricula by means of introductory courses (Muhar, Visser and Breda, 2013). By allowing students to integrate knowledges produced in different disciplines but applied to issues they face in common, University assumes a role in solving complex real world problems (Ling, 2012). Even when exclusively regarding science education, “specialization must be complemented, or even in some cases replaced, by an interdisciplinary understanding able to grasp the configurations, groupings and multiple perspectives that science must invoke towards a deeper knowledge of its objects of study” (Pombo, p.21).

Like the “hard” sciences and the techno-sciences, the arts, humanities, and social sciences are significant pathways toward knowledge. By providing literacy across disciplinary boundaries, educational institutions can foster a community of shared knowledge, contribute to the development of active citizenship, and dynamically engage a diversity of audiences towards sustainable development.

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